Valence Shell Electron Pair Repulsion Theory (VSEPR)

In order to determine the geometry of a molecule, we must consider the number and type of valence electrons around given atoms within that molecule.

There are several assumptions that are made in VSEPR:

- Electrons form pairs around an atom. Those that are involved in bonding are known as bonding pairs, and those that aren't are known as lone pairs
- Electron pairs repel each other. Lone pairs are placed around the atom so that there is the greatest distance possible between them because of this
- · Lone pairs occupy more space than bonding pairs. This means that electron pair repulsion increases in the series:

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bonding pair - bonding pair < bonding pair - lone pair < lone pair - lone pair
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To work out the geometry around a given atom use the following steps:

- 1. Draw the Lewis structure
- 2. Decide which atom you want to look at
- 3. Count the electrons around that atom
- 4. Use the number of electron pairs, bonding pairs and lone pairs to determine the Notesale.co.uk geometry

Counting the Electrons

- Take the group number for the a cn in question
 Add electrons for various substituents
 Single bonds have ne electron
- 2. Add electrons for various substituents

 - Doul le bonds add two election.
 - Triple bonds, add three electrons
- 3. Add an electron to this total for each formal negative charge and remove an electron for each formal positive charge on the atom
- 4. Divide the number of total electrons by two to give the number of valence electron pairs (VEP)
- 5. Deduce the number of lone pairs and bonding pairs.

If there are multiple bonds present around the atom in question, then simply deduct one pair of electrons for each π bond, as this gives the number of σ electron pairs present. The outcome of this is the number of VEP.

VEP determines electron pair geometry in the following way:

VEP	Electron Pair Geometry
2	Linear
3	Trigonal planar
4	Tetrahedral
5	Trigonal bipyramidal
6	Octahedral